# CHAPTER 2

## DESCRIPTION OF THE RED RIVER WATERSHED



**2.1. BACKGROUND.** The Red River is a major stream of north-central Tennessee and south-central Kentucky and is a major tributary of the Cumberland River. The stream's name derives from its typical water color. This is caused by a large load of clay and silt which contains iron oxides.

It rises in Sumner County, TN south of Portland and trends generally northwest. A major tributary, South Fork, forms nearby and runs parallel and south of the main river for several miles. For almost its entire length, it drains the northern Highland Rim of Tennessee and the adjacent (and analgous) Pennyroyal Plateau of Kentucky.

The Red River crosses briefly into Simpson County, KY and then enters Logfan County, KY. The South Fork also crosses into Logan County, coming from Robertson County, TN and joining the Red west of Adairvaille. Crossing the state line into Robertson County, the Red continues to flow primarily westward but with minor meanders. Near

Adams, TN, it is joined by an important tributary, Sulphur Fork, at the historic site of Port Royal, now a designated State Historic Area of the State of Tennessee. About a mile and a half above its mouth into the Cumberland, the Red River is joined by the West Fork of the Red River, its last tributary, which drains eastern Christian County and western Todd County, KY.

This Chapter describes the location and characteristics of the Red River Watershed.

## 2.2. DESCRIPTION OF THE WATERSHED.

2.2.A. General Location. The Tennessee portion of the Red River Watershed is located in Middle Tennessee and includes parts of Cheatham, Davidson, Montgomery, Robertson, Sumner, and Stewart Counties.

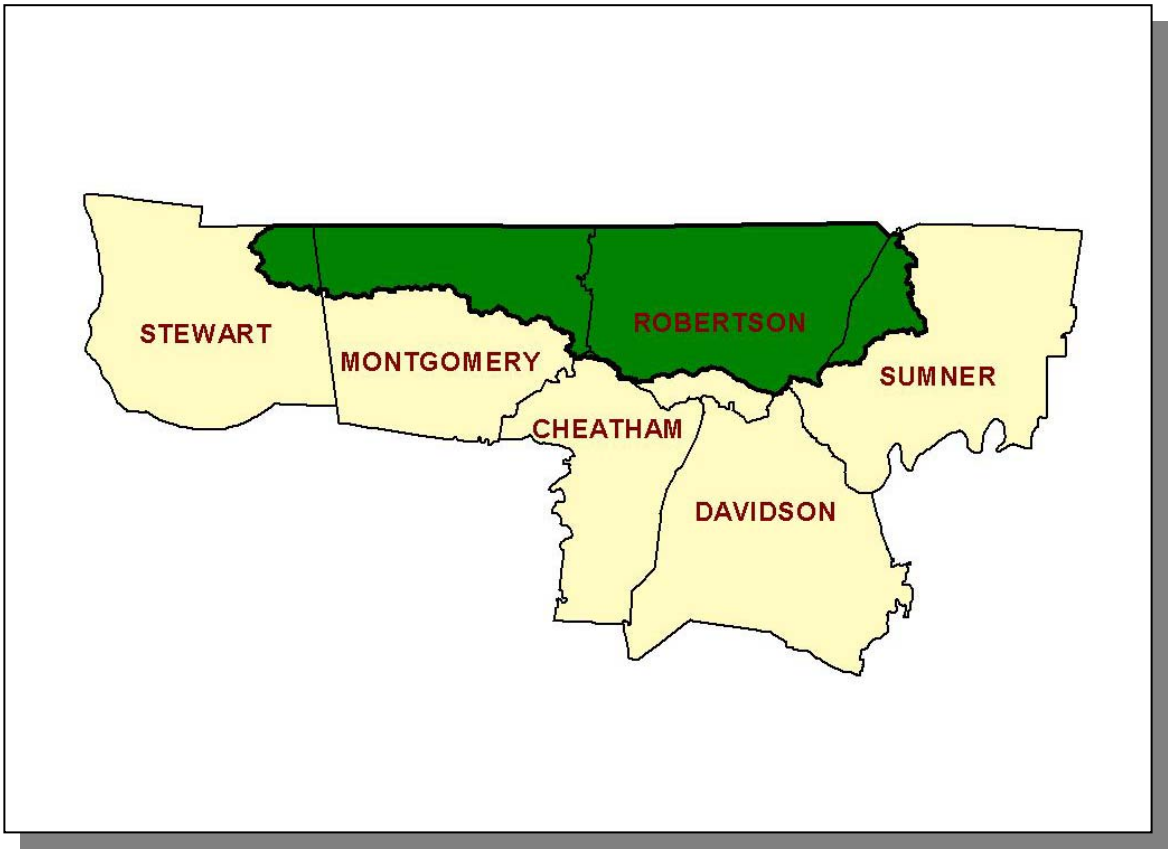


*Figure 2-1. General Location of the Tennessee Portion of the Red River Watershed.*

| COUNTY | % OF WATERSHED IN EACH COUNTY |
|---|---|
| Robertson | 55.6 |
| Montgomery | 30.6 |
| Sumner | 8.5 |
| Stewart | 5.1 |
| Cheatham | 0.2 |

***Table 2-1. The Red River Watershed Includes Parts of Five Middle Tennessee Counties.***

2.2.B. Population Density Centers. Twenty-seven highways serve the major communities in the Tennessee portion of the Red River Watershed.

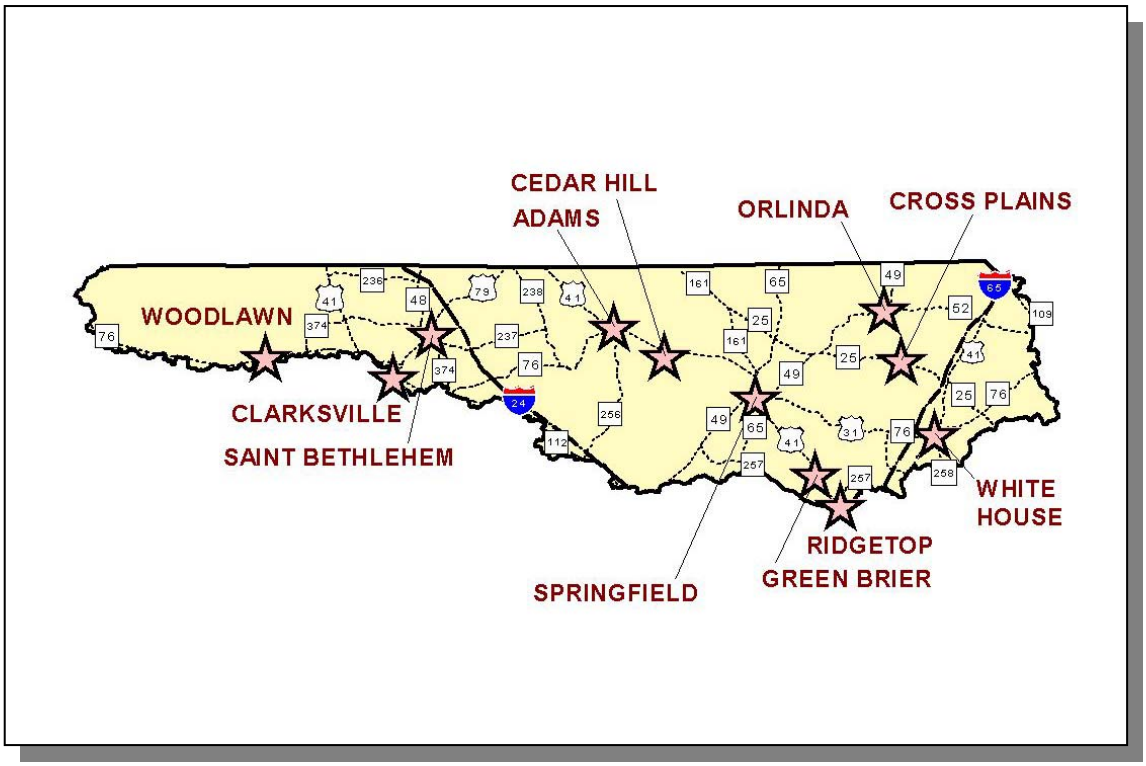


***Figure 2-2. Communities and Roads in the Tennessee Portion of the Red River Watershed.***

| MUNICIPALITY | POPULATION | COUNTY |
|---|---|---|
| Clarksville | 103,455 | Montgomery |
| Springfield* | 14,332 | Robertson |
| White House | 7,220 | Sumner / Robertson |
| Green Brier | 4,940 | Robertson |
| Cross Plains | 1,381 | Robertson |
| Ridgetop | 1,083 | Robertson / Davidson |
| Orlinda | 594 | Robertson |
| Adams | 566 | Robertson |
| Cedar Hill | 289 | Robertson |

***Table 2-2. Municipalities in the Tennessee Portion of the Red River Watershed.*** *Population based on 2000 census (Tennessee Blue Book) or http://www.hometownlocator.com. Asterisk (*) indicates county seat.*

## 2.3. GENERAL HYDROLOGIC DESCRIPTION.

2.3.A. Hydrology. The Red River Watershed, designated 05130206 by the USGS, is approximately 1,444 square miles (801 square miles in Tennessee) and drains to the Cumberland River.

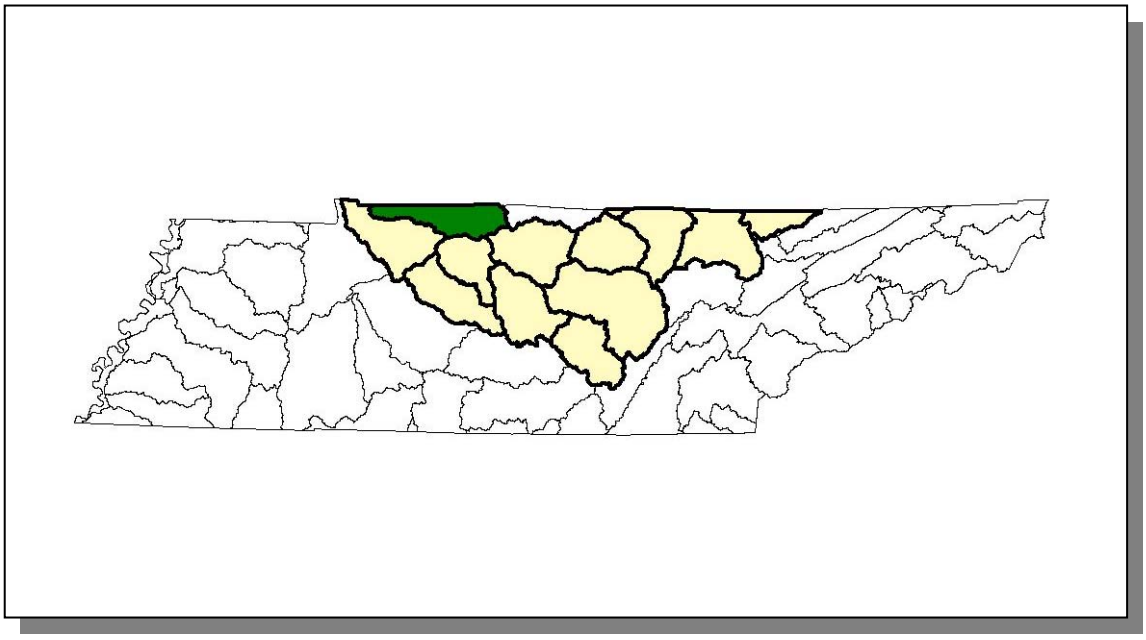

***Figure 2-3. The Red River Watershed is Part of the Cumberland River Basin.***

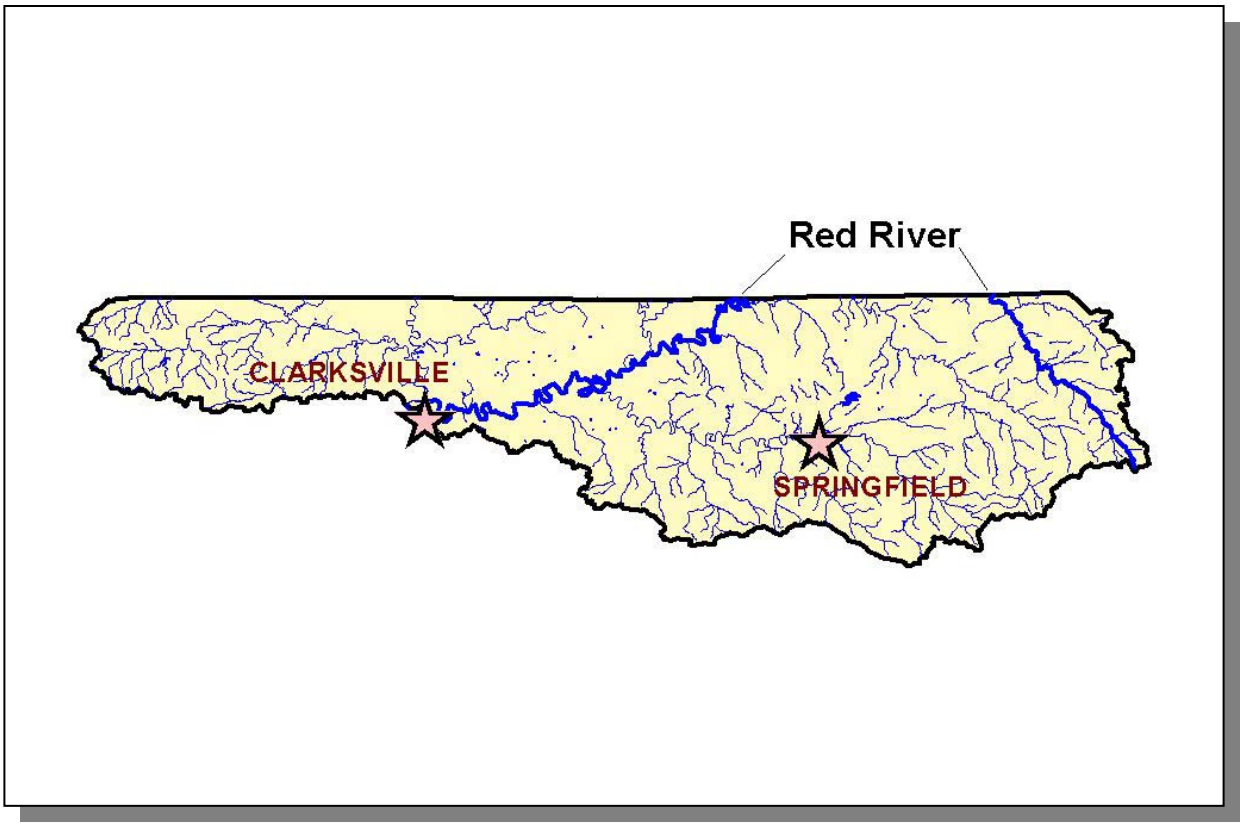


***Figure 2-4. Hydrology in the Tennessee Portion of the Red River Watershed.*** *There are 788.7 stream miles and 15 lake acres recorded in River Reach File 3 in the Tennessee portion of the Red River Watershed. Location of the Red River, and the cities of Clarksville and Springfield are shown for reference.*

2.3.B. Dams. There are 12 dams inventoried by TDEC Division of Water Supply in the Tennessee Portion of the Red River Watershed. These dams either retain 30 acre-feet of water or have structures at least 20 feet high.

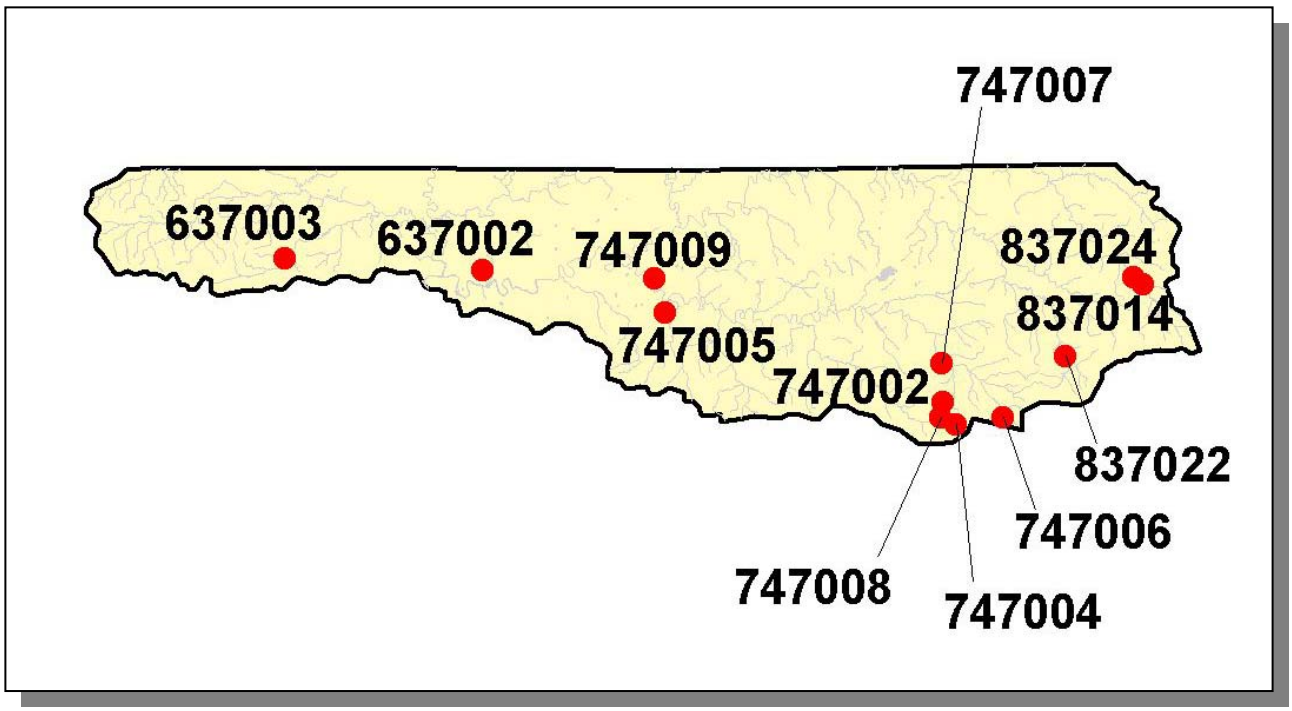


***Figure 2-5. Location of Inventoried Dams in the Tennessee Portion of the Red River Watershed.*** *More information is provided in Appendix II and at http://gwidc.memphis.edu/website/dws/.*

**2.4. LAND USE.** Land Use/Land Cover information was provided by EPA Region 4 and was interpreted from 1992 Multi-Resolution Land Cover (MRLC) satellite imagery.

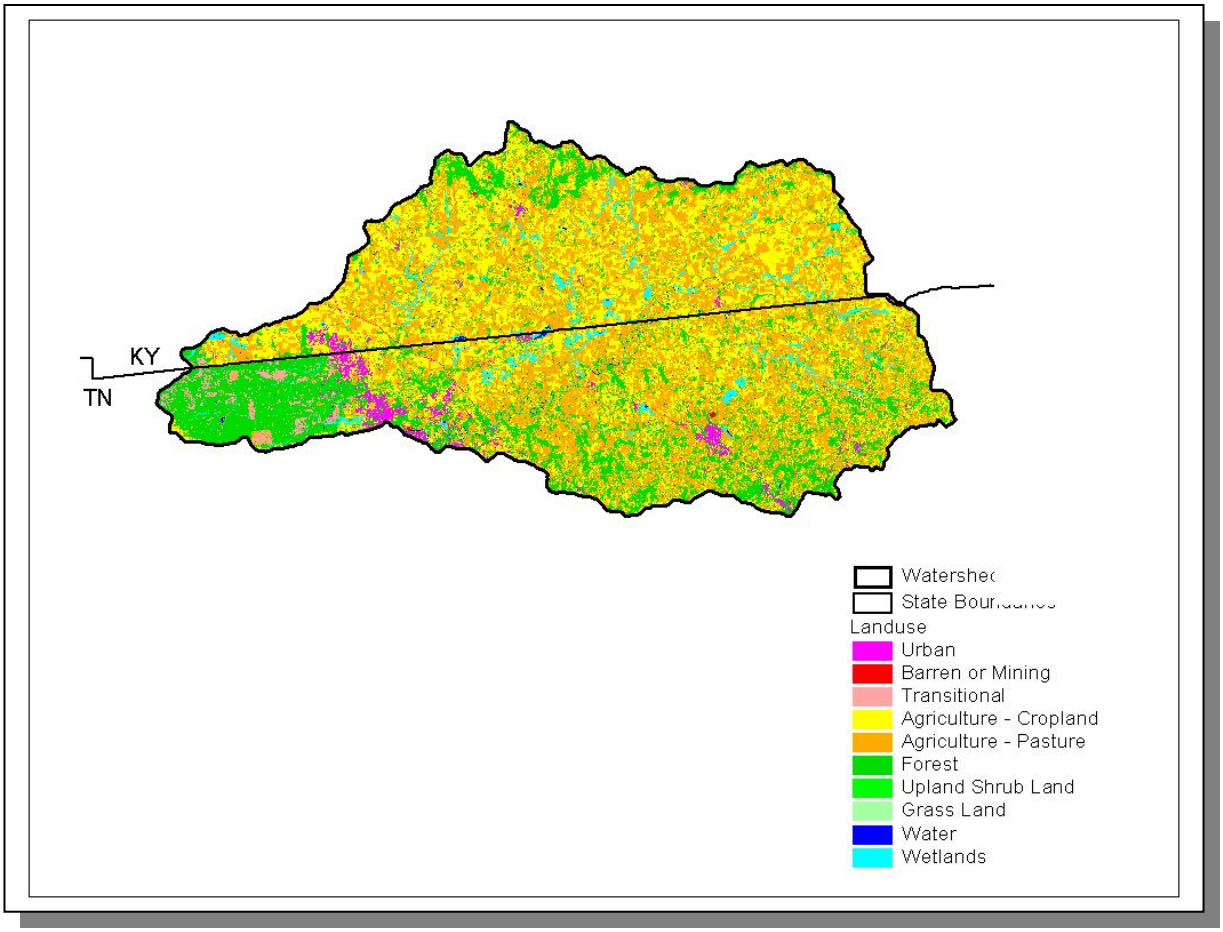


*Figure 2-6. Illustration of Select Land Cover/Land Use Data from MRLC Satellite Imagery.*

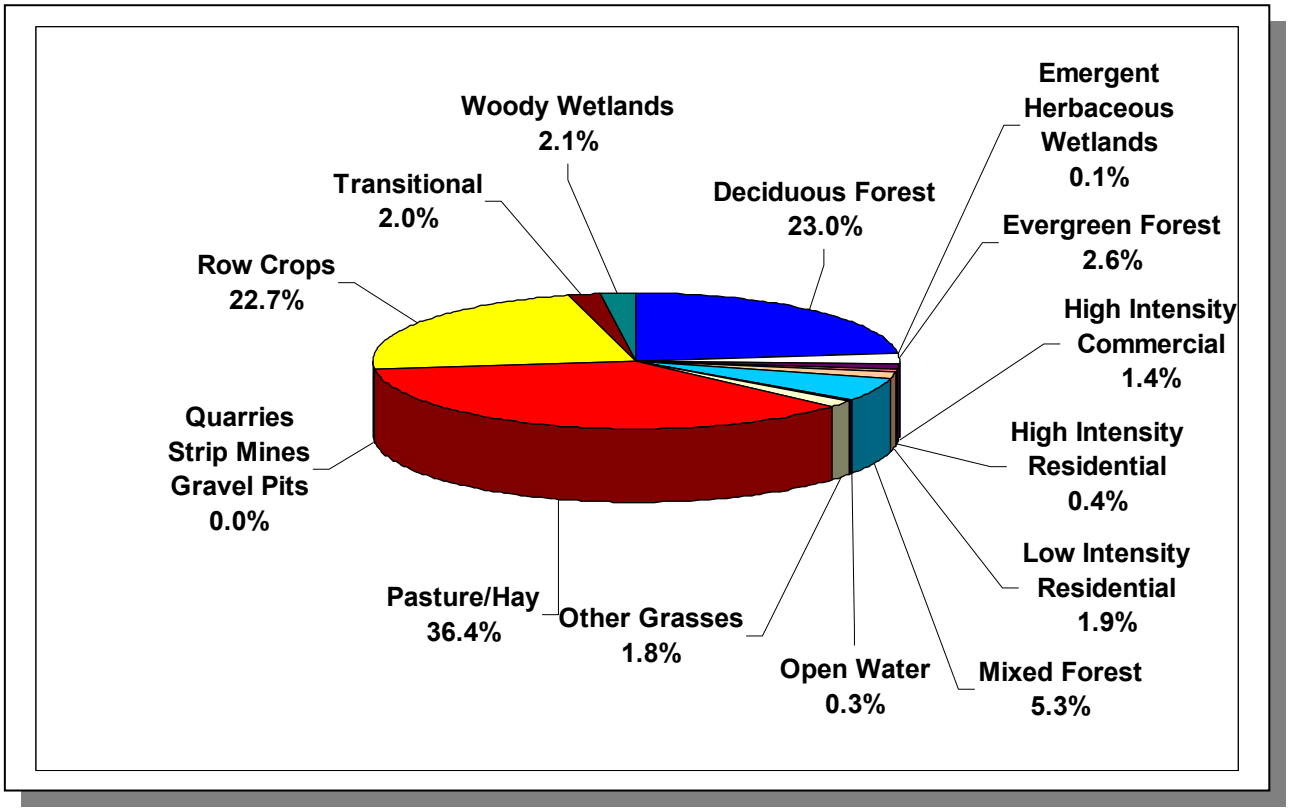


***Figure 2-7. Land Use Distribution in the Tennessee Portion of the Red River Watershed.***
*More information is provided in Appendix II.*

Sinkholes, springs, disappearing streams and caves characterize karst topography. The term "karst" describes a distinctive landform that indicates dissolution of underlying soluble rocks by surface water or ground water. Although commonly associated with limestone and dolomite (carbonate rocks), other highly soluble rocks such as gypsum and rock salt can be sculpted into karst terrain. In karst areas, the ground water flows through solution-enlarged channels, bedding planes and microfractures within the rock. The characteristic landforms of karst regions are: closed depressions of various size and arrangement; disrupted surface drainage; and caves and underground drainage systems. The term "karst" is named after a famous region in the former country of Yugoslavia.

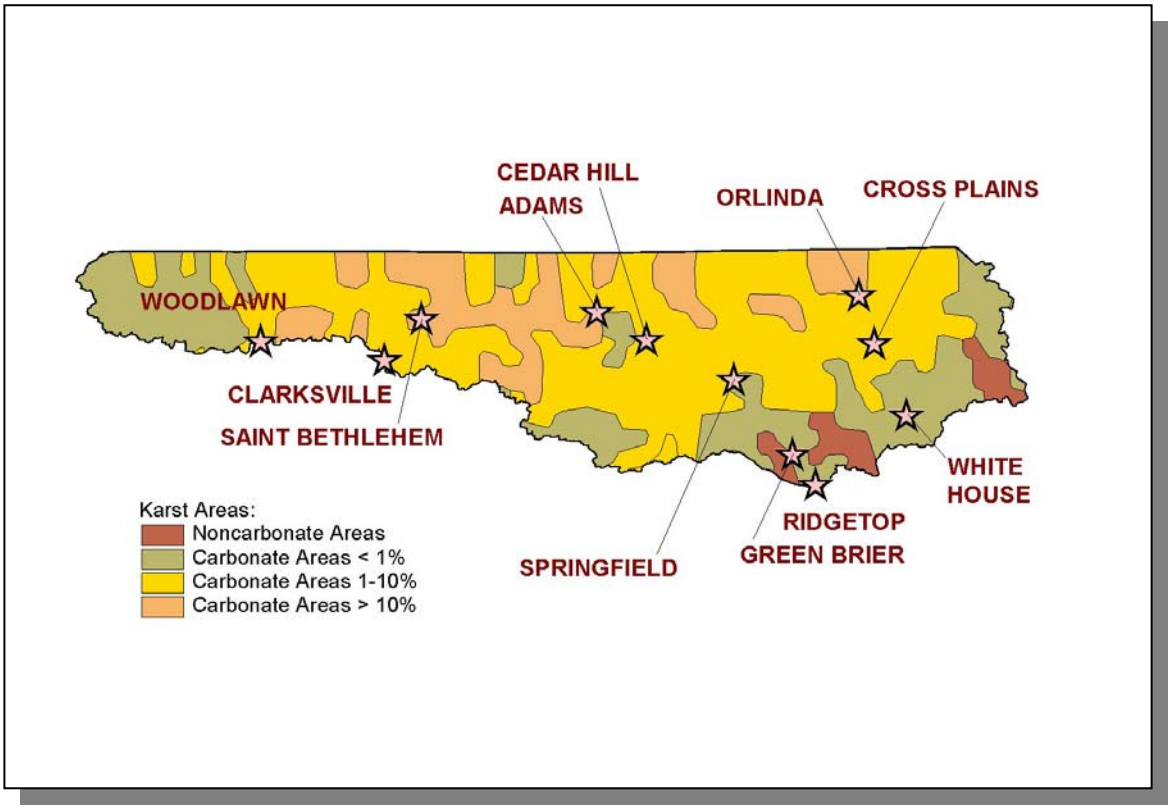


***Figure 2-8. Illustration of Karst Areas in the Tennessee Portion of the Red River Watershed.*** *Locations of communities in the watershed are shown for reference.*

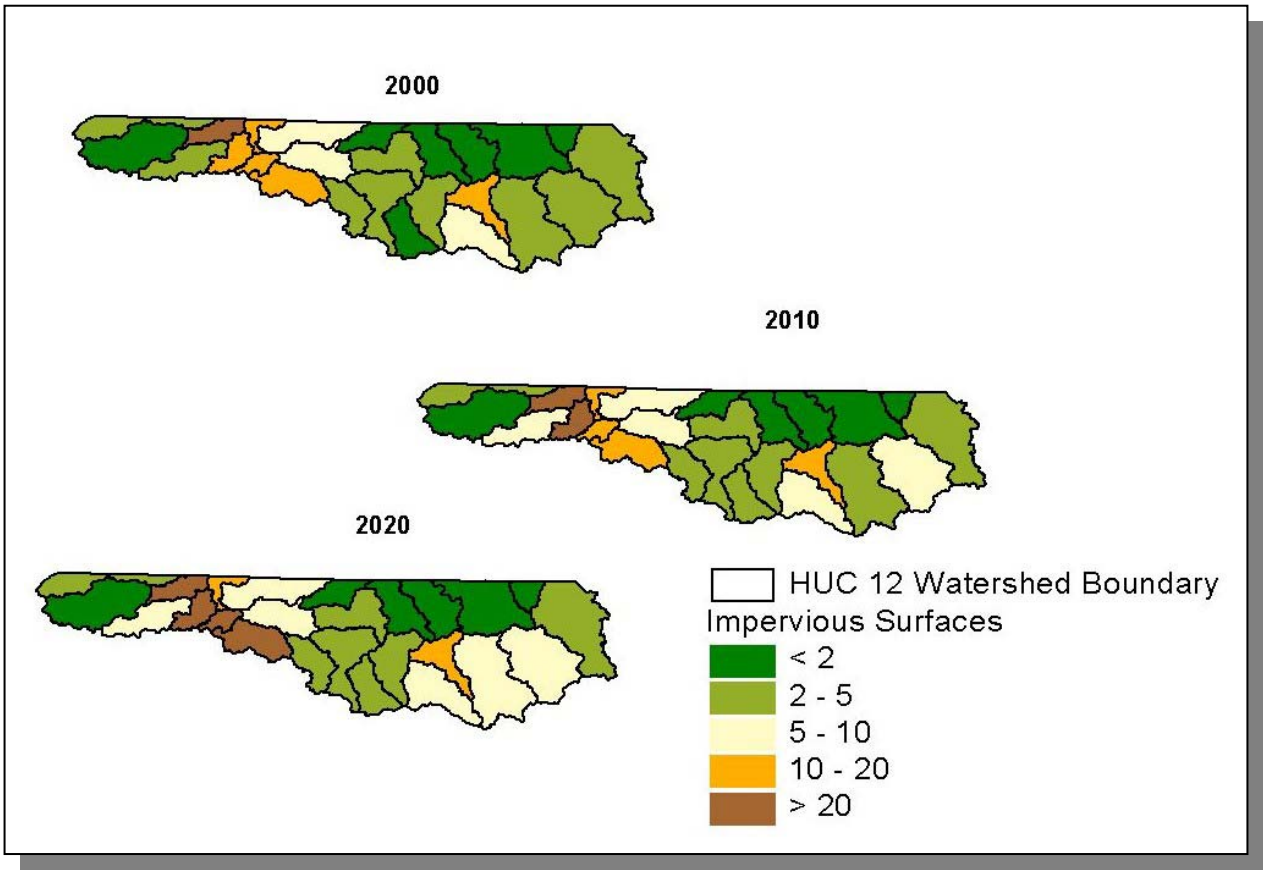


***Figure 2-9. Illustration of Total Impervious Area in the Tennessee Portion of the Red River Watershed.*** *All HUC-12 subwatersheds are shown. Current and projected total impervious cover is provided by EPA Region 4. More information can be found at: http://www.epa.gov/ATHENS/research/impervious/*

**2.5. ECOREGIONS AND REFERENCE STREAMS.** Ecoregions are relatively homogeneous areas of similar geography, topography, climate and soils that support similar plant and animal life. Ecoregions serve as a spatial framework for the assessment, management, and monitoring of ecosystems and ecosystem components. Ecoregion studies can aid the selection of regional stream reference sites, identifying high quality waters, and developing ecoregion-specific chemical and biological water quality criteria.

There are eight Level III Ecoregions and twenty-five Level IV subecoregions in Tennessee. The Tennessee portion of the Red River Watershed lies within 1 Level III ecoregion (Interior Plateau) and contains 3 Level IV subecoregions:

- The **Western Pennyroyal Karst (71e)** is a flatter area of irregular plains, with fewer perennial streams, compared to the open hills of the Western Highland Rim (71f). Small sinkholes and depressions are common. The productive soils of this notable agricultural area are formed mostly from a thin loess mantle over residuum of Mississippian-age limestones. Most of the region is cultivated or in pasture; tobacco and livestock are the principal agricultural products, with some corn, soybeans, and small grains. The natural vegetation consisted of oak-hickory forest with mosaics of bluestem prairie. The barrens of Kentucky that extended south into Stewart, Montgomery, and Robertson counties, were once some of the largest natural grasslands in Tennessee.

- The **Western Highland Rim (71f)** is characterized by dissected, rolling terrain of open hills, with elevations of 400-1000 feet. The geologic base of Mississippian-age limestone, chert, and shale is covered by soils that tend to be cherty, acid, and low to moderate in fertility. Streams are characterized by coarse chert gravel and sand substrates with areas of bedrock, moderate gradients, and relatively clear water. The oak-hickory natural vegetation was mostly deforested in the mid to late 1800's, in conjunction with the iron-ore related mining and smelting of the mineral limonite, but now the region is again heavily forested. Some agriculture occurs on the flatter interfluves and in the stream and river valleys: mostly hay, pasture, and cattle, with some cultivation of corn and tobacco.

- The **Eastern Highland Rim (71g)** has level terrain, with landforms characterized as tablelands of moderate relief and irregular plains. Mississippian-age limestone, chert, shale, and dolomite predominate, and karst terrain sinkholes and depressions are especially noticeable between Sparta and McMinnville. Numerous springs and spring-associated fish fauna also typify the region. Natural vegetation for the region is transitional between the oak-hickory type to the west and the mixed mesophytic forests of the Appalachian ecoregions (68, 69) to the east. Bottomland hardwood forest has been inundated by several large impoundments. Barrens and former prairie areas are now mostly oak thickets or pasture and cropland.

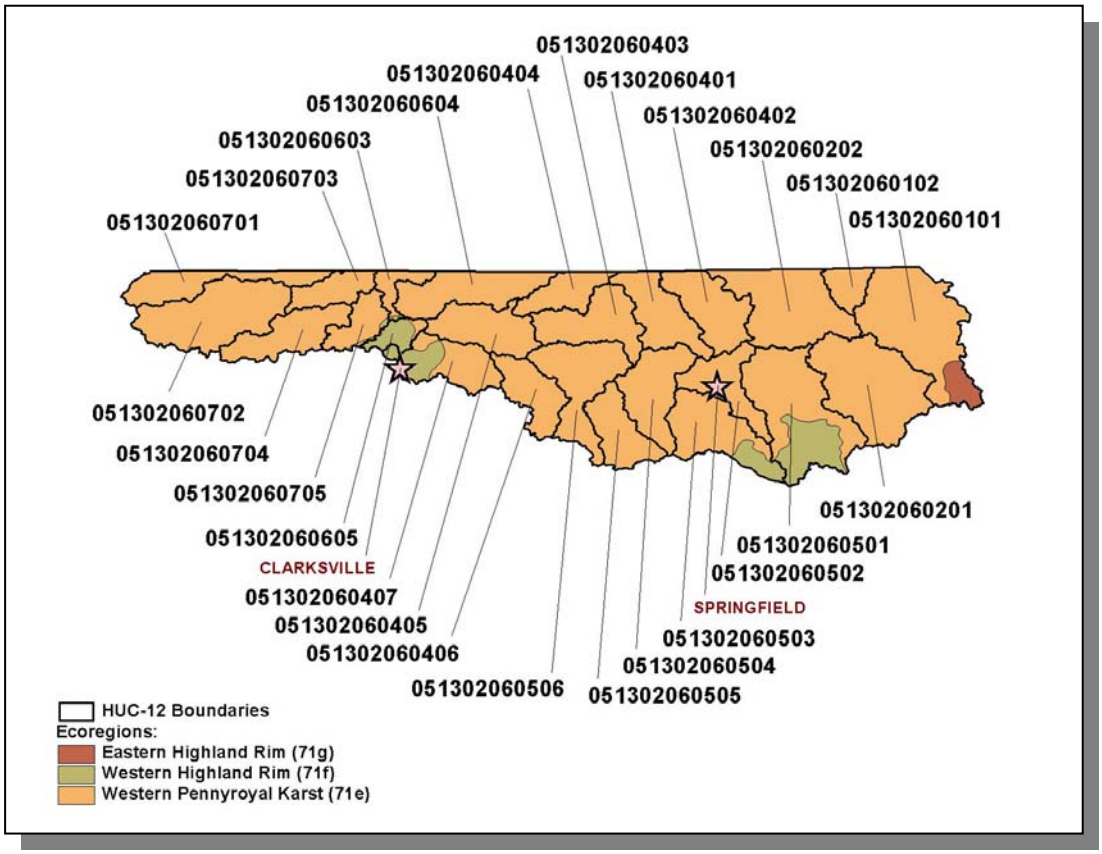


***Figure 2-10. Level IV Ecoregions in the Tennessee Portion of the Red River Watershed.*** *Locations of Clarksville and Springfield are shown for reference.*

Each Level IV Ecoregion has at least one reference stream associated with it. A reference stream represents a least impacted condition and may not be representative of a pristine condition.

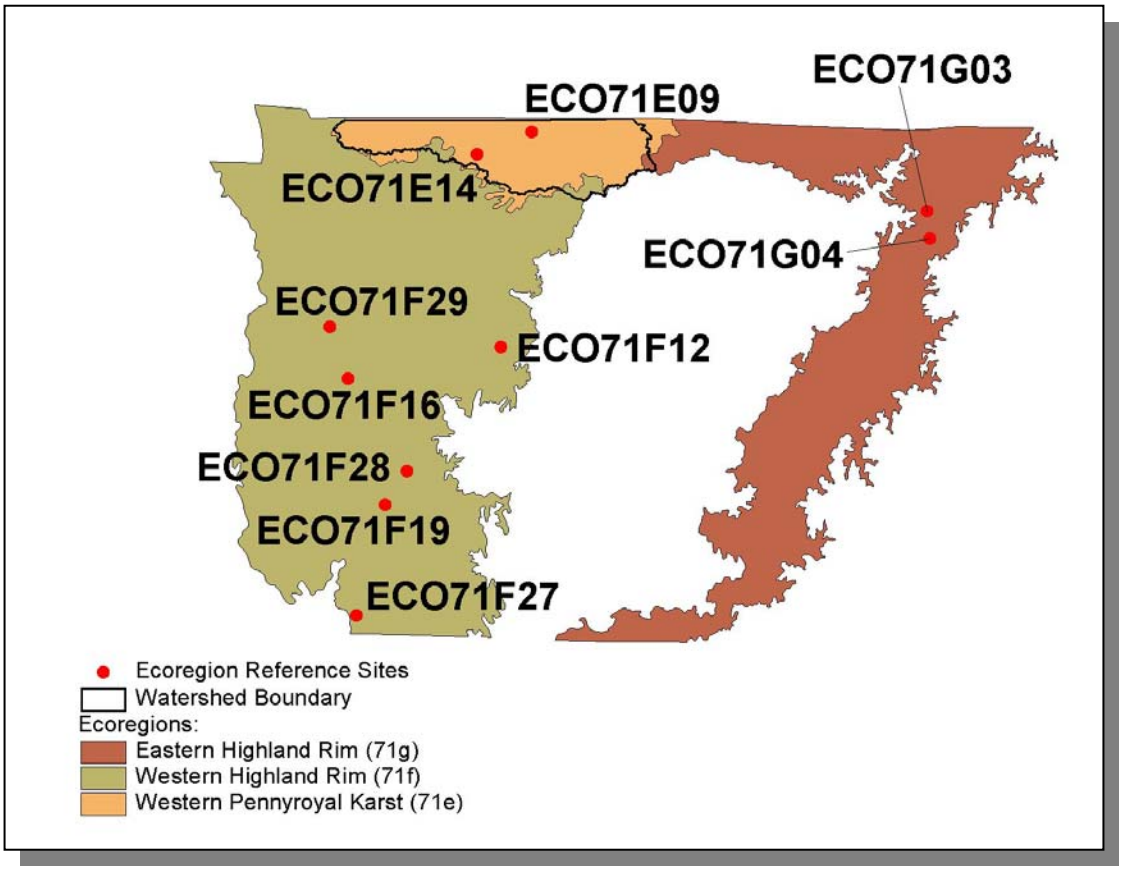


**Figure 2-11. Ecoregion Monitoring Sites in Level IV Ecoregions 71e, 71f, and 71g.** The Tennessee portion of the Red River Watershed is shown for reference. *More information, including which ecoregion reference sites were inactive or dropped prior to 01/01/2006, is provided in Appendix II.*

## 2.6. NATURAL RESOURCES.

2.6.A. Designated State Natural Area. The Natural Areas Program was established in 1971 with the passage of the Natural Areas Preservation Act. TDEC/Division of Natural Heritage administers the State Natural Areas program. Further information may be found at http://www.state.tn.us/environment/nh/natareas/

The Tennessee portion of the Red River Watershed has one Designated State Natural Area:

> **Dunbar Cave Class I Scenic-Recreational State Natural Area** is a 115-acre natural area in Montgomery County. Its significant feature is a well-explored scenic and historic cave, which above ground is surrounded by an upland hardwood forest. A stream exits the cave and has been impounded to form a small lake that is inhabited by many fish, turtles, and other wildlife. Humans have been attracted to Dunbar Cave for thousands of years with its constant stream flow and natural air conditioning. There have been recent excavations near the entrance that reveal it to be an important archeological site. One projectile point found at Dunbar Cave dates back as much as 10,000 years to the Paleo-Indian culture.

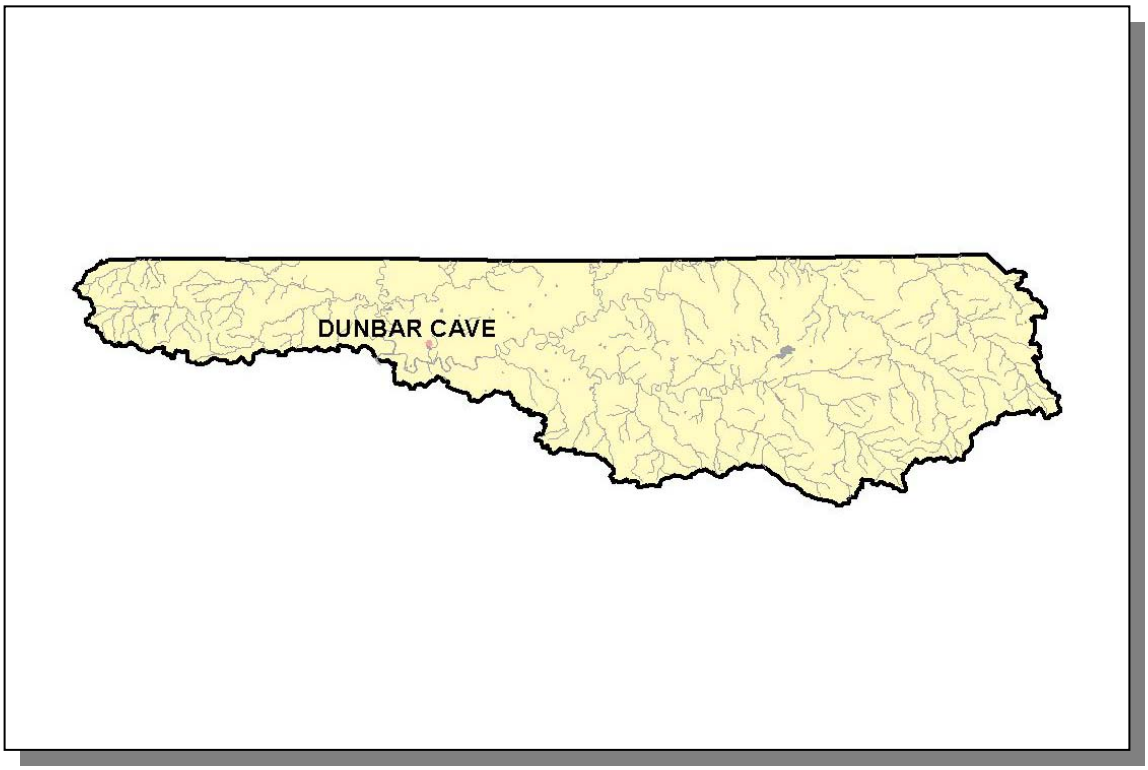


***Figure 2-12. There is One Designated State Natural Area in the Tennessee Portion of the Red River Watershed.***

2.6.B. Rare Plants and Animals. The Heritage Program in the TDEC Division of Natural Heritage maintains a database of rare species that is shared by partners at The Nature Conservancy, Tennessee Wildlife Resources Agency, the US Fish and Wildlife Service, and the Tennessee Valley Authority. The information is used to: 1) track the occurrence of rare species in order to accomplish the goals of site conservation planning and protection of biological diversity, 2) identify the need for, and status of, recovery plans, and 3) conduct environmental reviews in compliance with the federal Endangered Species Act.

| GROUPING | NUMBER OF RARE SPECIES |
|---|---|
| Crustaceans | 2 |
| Insects | 1 |
| Snails | 1 |
| | |
| Amphibians | 3 |
| Birds | 8 |
| Fish | 5 |
| Mammals | 6 |
| Reptiles | 2 |
| | |
| Plants | 29 |
| | |
| **Total** | **57** |

***Table 2-3. There are 57 Known Rare Plant and Animal Species in the Tennessee Portion of the Red River Watershed.***

In the Tennessee portion of the Red River Watershed, there are five known rare fish species, one known rare snail species, and two known rare crustacean species.

| SCIENTIFIC NAME | COMMON NAME | FEDERAL STATUS | STATE STATUS |
|---|---|---|---|
| *Etheostoma cinereum* | Ashy darter | | T |
| *Etheostoma microlepidum* | Finescale darter | | D |
| *Etheostoma tippecanoe* | Tippecanoe darter | | D |
| *Percina phoxacephala* | Slenderhead darter | | D |
| *Typhlichthys subterraneus* | Souhern cavefish | | D |
| | | | |
| *Orconectes pellucidus* | Eyeless crayfish | | |
| *Stygobromus vitreus* | An amphipod | | |
| | | | |
| *Lithasia salebrosa* | Rustic rocksnail | | |

***Table 2-4. Rare Aquatic Species in the Tennessee Portion of the Red River Watershed.*** *State Status: T, Listed Threatened by the Tennessee Wildlife Resources Agency; D, Deemed in Need of Management by the Tennessee Wildlife Resources Agency. More information may be found at http://www.state.tn.us/environment/na/.*

2.6.C. Wetlands. The Division of Natural Heritage maintains a database of wetland records in Tennessee. These records are a compilation of field data from wetland sites inventoried by various state and federal agencies. Maintaining this database is part of Tennessee's Wetland Strategy, which is described at:

http://www.state.tn.us/environment/nh/wetlands/

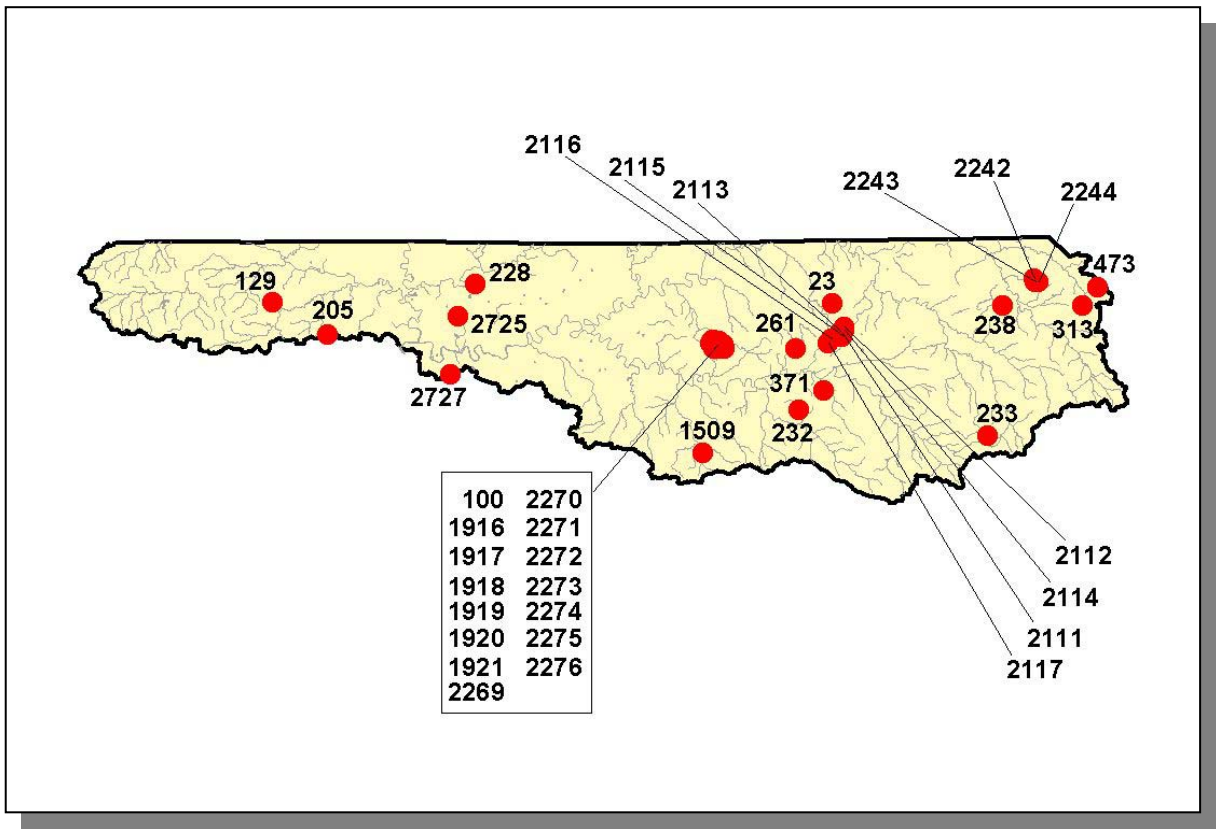


***Figure 2-13. Location of Wetland Sites in TDEC Division of Natural Heritage Database in the Tennessee Portion of the Red River Watershed. This map represents an incomplete inventory and should not be considered a dependable indicator of the presence of wetlands.*** *There may be additional wetland sites in the watershed. More information is provided in Appendix II.*

## 2.7. CULTURAL RESOURCES.

2.7.A. Nationwide Rivers Inventory. The Nationwide Rivers Inventory, required under the Federal Wild and Scenic Rivers Act of 1968, is a listing of free-flowing rivers that are believed to possess one or more outstanding natural or cultural values. Exceptional scenery, fishing or boating, unusual geologic formations, rare plant and animal life, cultural or historic artifacts that are judged to be of more than local or regional significance are the values that qualify a river segment for listing. The Tennessee Department of Environment and Conservation and the Rivers and Trails Conservation Assistance branch of the National Park Service jointly compile the Nationwide Rivers Inventory from time to time (most recently in 1997). Under a 1980 directive from the President's Council on Environmental Quality, all Federal agencies must seek to avoid or mitigate actions that would have an adverse effect on Nationwide Rivers Inventory segments.

The most recent version of the Nationwide Rivers Inventory lists portions of four streams in the Collins River Watershed:

> Elk Fork Red River (RM 0 to RM 8) flows through a karst area with exceptional geologic features including numerous sinkholes and caves and supports a significant black bass fishery and unique wildlife.
>
> Red River (RM 9 to RM 50 and RM 79 to RM 98) is a pastoral float stream with numerous sinkholes and caves, and heavily wooded bluffs with limestone outcroppings.
>
> South Fork Red River (RM 8 to RM 29) is a pastoral stream with low bluffs, numerous gravel bars and riffles, and banks lined with hardwoods.
>
> Sulphur Fork Red River (RM 0 to RM 27) is a natural springs area with wooded banks.

| RIVER | SCENIC | RECREATION | GEOLOGIC | FISH | WILDLIFE | HISTORIC | CULTURAL |
|---|---|---|---|---|---|---|---|
| Elk Fork | X | X | X | X | X | | |
| Red River | X | X | X | X | X | X | X |
| South Fork Red River | X | X | X | X | X | | |
| Sulphur Fork | X | X | X | X | | | |

***Table 2-5. Attributes of Streams Listed in the Nationwide Rivers Inventory.***

Additional information may be found online at http://www.ncrc.nps.gov/rtca/nri/

2.7.B. Public Lands. Some sites representative of the cultural heritage are under state or federal protection:

- Austin Peay State University Farm is owned and operated by Austin Peay State University for educational purposes. More information about this Environmental Education Center may be obtained by contacting Dr. Jack Caldwell at caldwellj@apsu.edu.

- Cedar Hill Swamp is a 200-acre area managed by TWRA in Robertson County.

- Dunbar Cave State Park is a State Natural Area located in Montgomery County. More information may be found at http://www.state.tn.us/environment/parks/parks/DunbarCave.

- Fort Campbell Military Reservation is located in both Tennessee and Kentucky (most of the reservation is located in Tennessee). More information may be found at http://www.campbell.army.mil/overview.htm.

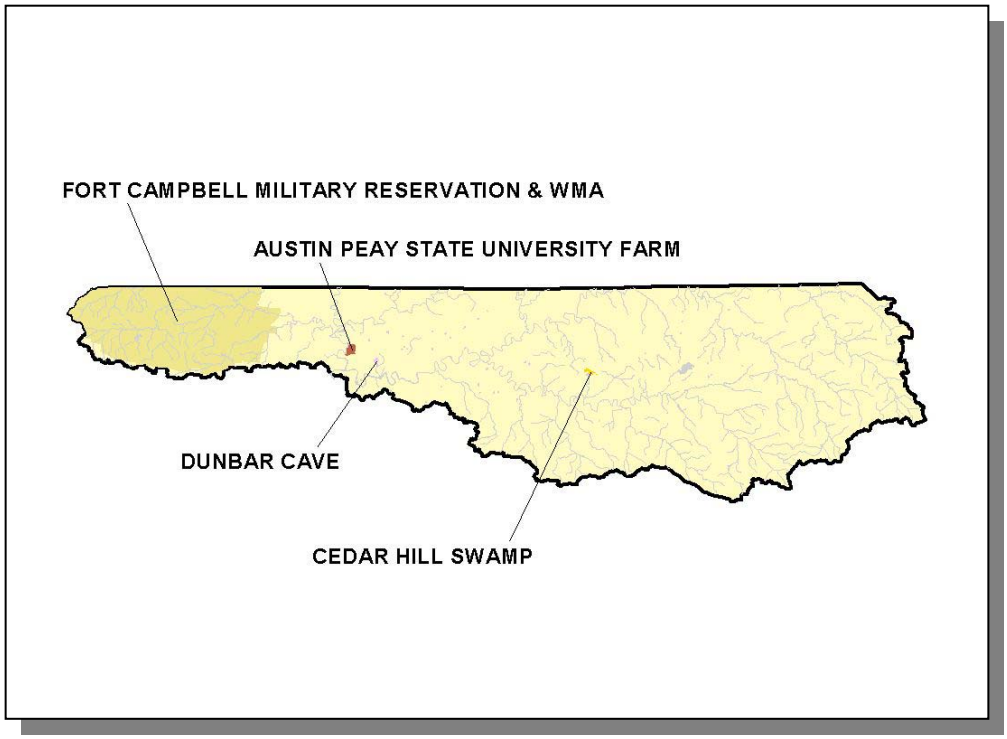


***Figure 2-14. Public Lands in the Tennessee Portion of the Red River Watershed.*** *Data are from Tennessee Wildlife Resources Agency. WMA, Wildlife Management Area.*

**2.8. TENNESSEE RIVERS ASSESSMENT PROJECT.** The Tennessee Rivers Assessment is part of a national program operating under the guidance of the National Park Service's Rivers and Trails Conservation Assistance Program. The Assessment is an inventory of river resources, and should not be confused with "Assessment" as defined by the Environmental Protection Agency. A more complete description can be found in the Tennessee Rivers Assessment Summary Report, which is available from the Department of Environment and Conservation and on the web at:

http://www.state.tn.us/environment/wpc/publications/riv/

| STREAM | NSQ | RB | RF | STREAM | NSQ | RB | RF |
|---|---|---|---|---|---|---|---|
| Beaverdam Creek | 3 | | | Millers Creek | 2 | | |
| Brush Creek | 2 | | | Passenger Creek | 2 | | |
| Buzzard Creek | 2 | | | Piney Fork Creek | 2 | | |
| Calebs Creek | 3 | | | Red River | 2,3 | 2,3 | |
| Carr Creek | 3 | | | South Fork Red River | 3 | | |
| Elk Fork Creek | 3 | 3 | | Spring Creek | 2 | 3 | |
| Dry Fork | | | | Sulphur Fork | 2,3 | 2 | |
| Empson Frey Branch | 2 | | | Summers Branch | 2 | | |
| Fletchers Creek | 3 | | | Valley Branch | 3 | | |
| Honey Run Creek | 2 | | 2 | Wartrace Creek | 2 | | |
| Little West Fork Red River | 3 | | | Weavers Creek | | | |
| Long Branch Sulphur Fork | | | | West Fork Red River | 3 | 3 | |

***Table 2-6. Stream Scoring from the Tennessee Rivers Assessment Project.***

Categories: NSQ, Natural and Scenic Qualities
RB, Recreational Boating
RF, Recreational Fishing

Scores: 1. Statewide or greater Significance; Excellent Fishery
2. Regional Significance; Good Fishery
3. Local Significance; Fair Fishery
4. Not a significant Resource; Not Assessed